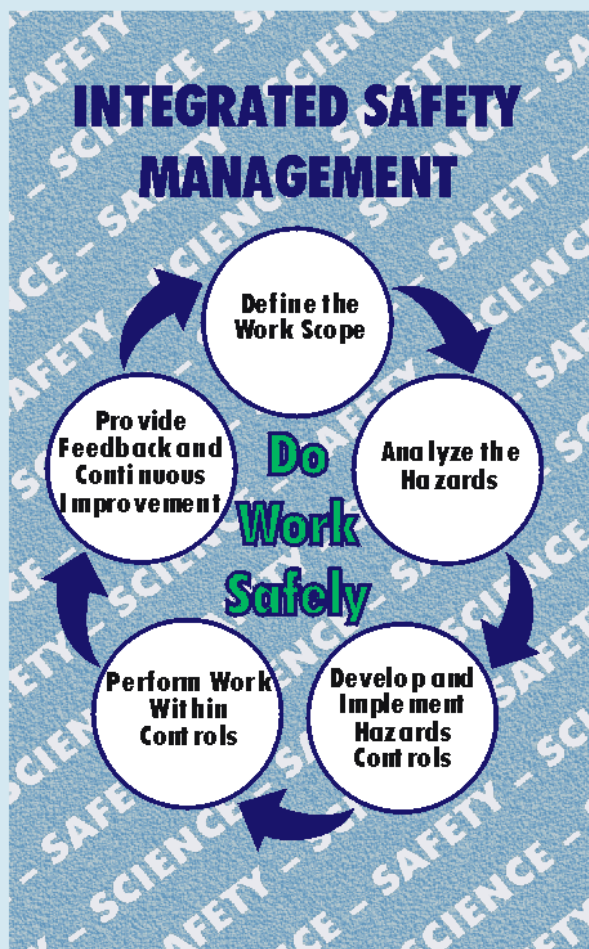


# SCIENCE AND SAFETY



**Office of Science  
U.S. Department of Energy**

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# SCIENCE AND SAFETY

## Introduction

***The Office of Science's goal is to be recognized as first class and a world leader in all we do.***

To be a world leader in science, we must be leaders in the conduct of operations as well. Office of Science (SC) line program managers are responsible for assuring the safe conduct of Science programs. We must learn from our own performance and from the performance of others who are world-class. Our challenge is to maintain our momentum and to continuously improve. Integrated Safety Management (ISM) helps us meet this challenge. The five Core Functions and seven Guiding Principles of ISM provide the framework for ISM systems developed for each facility or site that conducts SC research.

The safety and health of the work force and the public and the protection of the environment at SC's research facilities nationwide is implemented through ISM on all research initiatives and programs. This approach supports research while improving operations and avoiding injuries or program

delays from accidents or environmental releases.

This booklet is for use by SC Headquarters personnel to enhance communications with the SC sites about science and safety and to demonstrate commitment to ISM and excellence in Environment, Safety and Health (ES&H) practices. Headquarters employees have an obligation to communicate ES&H performance expectations and to foster a safe workplace culture. Program reviews, site visits and tours, and other interactions with field office and laboratory personnel provide opportunities to enhance awareness of ES&H. This can be achieved through observations and impromptu discussions with workers, users, supervisors, and managers regarding research operations, including discussion of hazards identification, job planning, protective measures, and related topics.

The remaining sections of this booklet discuss the following:

- The seven ISM Guiding Principles.
- The five ISM Core Functions (shown on the front cover of this booklet and the front of the companion ISM badge) with sample questions that may be useful for discussions about safety.

- Key Attributes that provide a general framework for communication and discussion about conducting science safely and are tied to the ISM Guiding Principles.

The back cover of this booklet and the back of the companion ISM badge provide several high-level questions related to ISM practices that may be useful for initiating discussions. This booklet is not intended to be used as a guide or checklist for ES&H audits, assessments, or oversight reviews.

## ISM Guiding Principles

- **Line Management Responsibility for Safety**

*Line management is directly responsible for the protection of the public, the workers, and the environment.*

- **Clear Roles and Responsibilities**

*Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organized levels within the Department and its contractors.*

- **Competence Commensurate with Responsibilities**

*Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.*

- **Balanced Priorities**

*Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment shall be a priority whenever activities are planned and performed.*

- **Identification of Safety Standards and Requirements**

*Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards and requirements shall be established that, when properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.*

- **Hazard Controls Tailored to Work Being Performed**

*Administrative and engineering controls to prevent and mitigate hazards shall be tailored to the work being performed and associated hazards.*

- **Operations Authorization**

*The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed upon.*

## ISM Core Functions (With Suggested Questions)

- **Define the Scope of Work**

*Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.*

- What process is used to prioritize tasks and to ensure that adequate resources are applied to ES&H activities?
- How does management communicate expectations for conducting research and operations safely and in an environmentally conscientious manner?
- How are plans developed and operations managed to minimize the types and volumes of waste generated and to prevent having legacy wastes at the end of the project?

- **Analyze the Hazards**

*Hazards are associated with the work identified, analyzed, and categorized.*

- What are the safety and environmental hazards/risks of this project and how were they identified and analyzed?



- How are safety and environmental hazards/risks managed to minimize danger and unintended interruptions in the research program?
- What are the highest priority worker safety, public health, and environmental issues?

- **Develop and Implement Hazards Controls**

*Applicable standards and requirements are identified and agreed upon, controls to prevent/mitigate hazards are identified, the safety envelope is established, and controls are implemented.*

- How are users, operators, technicians, and other workers involved in hazards identification and in developing the controls and mitigating measures?
- What standards, procedures, and training are used to conduct work safely?
- What policies and procedures are used to ensure that all projects and activities are reviewed for adequate hazards controls and mitigation?

- **Perform Work Within Controls**

*Readiness is confirmed and work is performed safely.*

- How are safety and environmental values engrained into the work ethic of project managers, supervisors, users, workers, and subcontractors?
- What response is required if an unexpected hazard is identified during project operations and how is corrective action determined and implemented?
- How are managers, supervisors, users, workers, and subcontractors held accountable for ES&H?
- How often are hazards controls and safety issues discussed with workers and users actually performing the work (e.g., holding shift or “tool box” meetings)?
- What actions are taken if someone is injured on the job?

- **Provide Feedback and Continuous Improvement**

*Feedback information on the adequacy of controls is gathered, opportunities for improving the definition and planning of work are identified and implemented, line and independent oversight is conducted, and,*

*if necessary, regulatory enforcement actions occur.*

- What ES&H lessons have been learned, and how have they been fed back into the projects?
- How are lessons learned incorporated into policies and procedures to support the continuous improvement process?
- How is the training program for users, workers, and students maintained current with lessons learned and procedure changes?

## Key Attributes

The ISM Guiding Principles and Core Functions provide general guidance applicable to all DOE activities. The Key Attributes described below for safely performing scientific research focus this general guidance more specifically on SC activities and provide additional clarification to emphasize their importance. Each Key Attribute relates to one or more of the ISM Guiding Principles as noted in the description. The Key Attributes are provided to support focused discussions on ES&H practices and performance at the SC laboratories and facilities.

- **Communicate Expectations**

*High standards for ES&H performance are established and effectively communicated throughout the organization.* This attribute is related to the ISM Guiding Principles of Line Management Responsibility for Safety and Clear Roles and Responsibilities. For these principles to be implemented successfully, line managers must ensure that both the users and the site staff at all levels understand and subscribe to excellence in ES&H for all scientific and research activities from initial planning through execution and completion. This can best be achieved by

providing positive reinforcement during planning and execution of the work and obtaining feedback from all levels in the organization on both successes and problems as the work progresses.

- **Know the Risks of Research and Operations**

*The health and safety risks to the workers and public and the risks to the environment are understood.* This attribute is related to the ISM Guiding Principles of Identification of Safety Standards and Requirements and Hazard Controls Tailored to Work Being Performed. This is achieved by identifying the hazards and establishing an agreed-upon set of standards and requirements tailored to the hazards associated with the work. Then, administrative and engineering controls are put in place to ensure that the requirements are met. Those who conduct research sponsored by SC must understand that while their research may not be without risks, the risks must be limited to conservatively low, acceptable levels. This approach provides for risks to be continuously considered and managed during work execution to avoid endangering workers and users, the public, or the

environment, and to avoid unintended interruptions to research.

- **Meet Established Requirements**

*Meeting ES&H requirements appropriate for the anticipated hazards of the work is the minimum level of performance for safe research.* This attribute is related to the ISM Guiding Principles of Identification of Safety Standards and Requirements, Hazard Controls Tailored to Work Being Performed, and Operations Authorization. During planning and before the work begins, applicable health and safety, environmental, and readiness reviews are completed and required permits are in place. The reviews demonstrate compliance with established requirements and standards. Safety and health and environmental protection values are engrained in the work ethic such that the site staff and users work in ways that result in completing scientific studies without endangering the workers, the public, or the environment. The responsibility of every researcher is to ensure that their individual research activities are properly planned and conducted according to the established requirements for safety and environmental protection. However, this does not guarantee that there will be no

problems, or that there will be no public controversies regarding the perceived safety of SC's research activities. Safety concerns may develop that were unforeseen during project planning. If a situation arises for which no appropriate standard or requirement has been invoked, the response should err on the side of safety and environmental stewardship.

- **Start Clean – Stay Clean**

*Research projects and facility operations are planned so that there will be no legacy wastes at the end of the project or the life of the facility.* This attribute is related to the ISM Guiding Principle of Hazard Controls Tailored to Work Being Performed. The potential for radiological or hazardous materials contamination must be considered during research program and facility planning, and features to prevent or mitigate contamination factored into facility, equipment, and process designs. Ongoing research and operations must be managed to minimize risk to the site staff, users, the public, and the environment and to minimize contamination and waste generation. The generator of wastes is responsible for minimizing the types and quantities of wastes generated, and is responsible for the treatment, storage,

and disposal of waste generated. This approach will minimize waste generation and the potential for interruption of research programs and undesirable diversion of funds to unplanned cleanup or waste management operations.

- **Involve Workers and Users**

*Workers and users are involved in developing ISM systems and ES&H plans and procedures and are trained to perform their work.* This attribute is related to the ISM Guiding Principles of Competence Commensurate with Responsibilities and Balanced Priorities. The workers and users provide working level knowledge of the work to be performed and information about relevant experience to ensure that all significant considerations are included in the planning process and procedure development. ES&H training and re-training are provided to both site staff and users as appropriate to the specific work and to the hazards/risks of the research and operations.

- **Involve the Public**

*Regular and frank communication occurs with neighbors and stakeholders.* This attribute is related to the ISM Guiding Principles of Balanced Priorities and Hazard



Controls Tailored to Work Being Performed. The public's views and concerns about the risks of research and operations are understood and taken into account. This approach will allow the public to understand the operations, the risks, and the measures taken to ensure the operations are conducted in a technically sound, safe, and environmentally acceptable manner.

- **Achieve Performance**

*In the end, success in the stewardship of science is measured by the achievement of excellence and relevance in science that has been performed safely and in an environmentally conscientious manner.* This attribute is related to the ISM Guiding Principle of Balanced Priorities. Successful implementation requires that resources be effectively allocated to address safety, programmatic, and operational considerations that adequately protect the workers, the users, the public, and the environment. The success of ISM is measured through actual ES&H performance. Systems to measure performance and appropriate performance indicators are in place. Actual performance, as measured against the performance indicators, is acceptable and shows improvement over time.

## DISCUSSION QUESTIONS

- How are ES&H performance expectations communicated to you and by you?
- How are hazards/risks of work identified, analyzed, and mitigated, and what are they?
- What wastes are generated, and how are they minimized?
- How are the workers and users involved in planning the work and trained for the work?
- How do you involve neighbors and stakeholders, and what are their concerns?
- What are your ES&H performance indicators and your degree of success?